On *Rhinoestrus steyni* n.sp. and *Gasterophilus zebrae* Rodhain & Bequaert (Diptera), parasites of Burchell's zebra *(Equus burchelli* Gray*)*.

by

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Through the kindness of Mr. T. J. Steyn, Director of Nature Conservation in the Transvaal, I was given permission to kill a zebra in the Hans Merensky Nature Reserve (P.O. Letsitele, N. Transvaal), for scientific purposes. This zebra, living in a half-tame condition with a few horses, was causing some trouble and had therefore to be destroyed.

The examination of this zebra produced some interesting results. The nasal cavities proved to be infested with larvae of a *Rhinoestrus* species (Oestridae), and the stomach with larvae of one *Gasterophilus* species (Gasterophilidae) The latter were attached to one small area of the stomach, the remaining part of the gut being free of maggots. This last finding is unusual, because zebras normally harbour a dense population composed of several species of *Gasterophilus*.

Some of the seemingly mature larvae of both species were isolated in jars containing dry sand. Five flies hatched after 4—5 weeks and were found to represent a new species of *Rhinoestrus* (1 ♂) and a species of *Gasterophilus* (1 ♂, 3 ♀ ♀), which had already been described from the 3rd larval stage, but was not yet adequately known in the adult stage, and had been confused with another species parasitizing the horse.

1. **Rhinoestrus steyni** n.sp.

a) *Larval stages.*

The zebra was shot on the 22nd April, 1957 and its head opened a few hours later. Six larvae of the 3rd and 1 larva of the 2nd stage were removed.

Up to the present time, four species of *Rhinoestrus* were known from the Ethiopian region, namely *R. hippopotami* Grünberg (from the hippopotamus), *R. nivarleti* Rodhain & Bequaert (from the bush-pig), *R. phacochoeri* Rodhain & Bequaert (from the wart-hog) and *R. purpureus* Brauer (from horse, mules and zebras). It is quite possible that *R. purpureus*, the original host of which is undoubtedly the horse, may sometimes parasitize the zebra too, but it is probable that at least some of the old records refer to the new species. Rodhain & Bequaert (1916), in their excellent revision of the Oestrinae of the African continent, have given a table for the identification of the 3rd larval stages of the *Rhinoestrus* species. I have translated the table and added *R. steyni* (see table 1) I have been able to study the larvae of all the Ethiopian *Rhinoestrus* species from material, which was kindly lent to me by the authorities of the Musée Royal du Congo Belge, Tervuren, and by the British Museum of Natural History, London.

According to table 1, the 3rd larval stage of *R. steyni* is characterized by a relatively great number of rows of spinules and is somewhat intermediate between *R. purpureus* and *R. nivarleti*. Of the six 3rd stage larvae recovered, a few were mature, measuring up to 20 mm, and one still belonged to the second stage. The posterial stigmal plates and the cephalosceleton of both stages have been dissected (figs. 1 & 2). These larvae are regarded as paratypes (comp. B. de Meillon & F. Zumpt, 1951).

b) *Imago.*

The adult fly, in contrast to the larva, is very similar to *R. hippopotami*. I have not yet seen imagines of *R. phacochoeri* but according to Rodhain & Bequaert, *R. phacochoeri* and *R. purpureus* must resemble one another very closely. The Ethiopian *Rhinoestrus* species can be separated by the following key:

1 (2) Vein r-m located before or at the middle of M_2, at or before level of apex of sc.
Body predominantly dark brown with or without yellow pollinosity. Thorax and abdomen with a great number of tiny dot-like pustules, each bearing a black hair. Parafrontalia with large globular tubercles, parafacialia with flat ones, both kinds provided with a long black hair. Parafrontalia and frontal stripe predominantly black-brown, face except the 2nd and 3rd antennal segments orange-yellow, parafacialia and buccae without dark spots. 11—13 mm. Larvae in the nasal cavities of the Bush Pig (*Potamochoerus porcus* L.). — Belgian Congo.
nivarleti Rodhain & Bequaert.

2 (1) Vein r—m located beyond middle of M_2 and beyond level of apex of sc 3

3 (6) Smaller species of 8—11 mm body-length. Abdomen provided with big coniform tubercles, the tips of which are bent and directed backwards 4

4 (5) Larvae in the nasal cavities of horse, mule (and zebra?).
Head yellow or orange; ocelli, the 3rd antennal segments and the mouth-parts blackish. Parafrontalia with big, rounded tubercles, most of which are distinctly separated from one another. Parafacialia with smaller and flatter tubercles, buccae without spots.

TABLE 1.

Comparative table of spinulation of 3rd instar *Rhinoestrus* larvae.

Region of body Spimitàtion	*Rh. steyni* n.sp.	*Rh. hippopotami* Grünb.	*Rh. nivarleti* Rodh. & Beq.	*Rh. phacochoeri* Rodh. & Beq.	*Rh. purpureus* (Brauer).
A. Pseudocephalon :					
dorsal surface	present	present	present	absent	present
ventral surface	,,	,,	,,		,,
B. Dorsal surface (anterior margin)				absent	
3rd segment	3-4 rows	2-3 rows	3-4 rows		3 rows
4th ,,	3-4 ,,	2-3 ,,	3-4 ,,		3 ,,
5th ,,	3-4 ,, (interrupted)	small lateral groups	3-4 ,,		3 ,, (± interrupted)
6th ,,	lateral groups	,, ,, ,,	small lateral groups		3 ,, ,,
7th ,,	,, ,,	,, ,, ,,	sometimes small lat. groups		small lateral groups
8th ,,	,, ,,	sometimes small lateral groups	,, ,, ,,		,,
9th ,,	,, ,,	usually absent	absent		absent
10th ,,	small lateral groups	,, ,,	,,		,,
11th ,,	,, ,, ,,	,, ,,	,,		,,
12th ,,	absent	,, ,,	,,		,,
C. Ventral surface : (anterior margin)					
3rd segment	3-4 rows	1-2 rows	2-3 rows	1 row	3-4 rows
4th ,,	3-4 ,,	1-2 ,,	2 ,,	2 rows	3-4 ,,
5th ,,	4-5 ,,	2-3 ,,	3-4 ,,	2 ,,	3-4 ,,
6th ,,	5-6 ,,	2-3 ,,	5 ,,	2 ,,	4 ,,
7th ,,	5 ,,	2-3 ,,	6 ,	2-3 ,,	4 ,,
8th ,,	4-5 ,,	2-3 ,,	6 ,	2-3 ,,	4 ,,
9th ,,	4-5 ,,	3 ,,	6 ,	2-3 ,,	4 ,,
10th ,,	4-5 ,,	3 ,,	6 ,	2-3 ,,	4 ,,
11th ,,	4-5 ,,	2-3 ,,	3-4 ,,	2-3 ,,	4 ,,
12th ,,	6-7 ,,	usually absent	1-4 ,,	absent	numerous
D. posterior margin of latero-ventral bulges	present	absent	a small group of spines on each side on certain segments	absent	present
E. Median post-anal bulge	present	present	present	present	present *
F. Median pre-anal bulge.	present	present	present	present	present.*

* Completed by present author.

Thorax with coarse tubercles, most of them bearing a black hair. General colouring of thorax and abdomen is a reddish brown, pruinosity silvery-white, forming an irregular and varying pattern, mesonotum with 4 incomplete, black longitudinal stripes. — Distributed all over the Palaearctic region, but rare in the Oriental region and in Africa south of the Sahara, where it has been introduced with horses . . . . **purpureus** (Brauer).

5 (4) Larvae in the nasal cavities of the wart-hog (*Phacochoerus aethiopicus Pallas*).

I have not seen adults of this species. In spite of the long description given by Rodhain & Bequaert (1916), I cannot find features which seem to be clear and distinct enough to separate it from *R. purpureus*. — Belgian Congo.

phacochoeri Rodhain & Bequaert.

6 (3) Bigger species of 11—13 mm body-length. Abdomen provided with smaller and lower tubercles, which are rarely distinctly coniform 7

7 (8) Tubercles of parafrontalia isolated from one another, at most two or three neighbouring ones close together.

Body predominantly brown, partly blackish, pollinosity white. Parafacialia with dark tubercles like the parafrontalia, but they are smaller. Face yellow to orange, buccae without dark spots. Larvae in the nasal cavities of the Hippopotamus (*Hippopotamus amphibius* L.). — Cameroons, Belgian Congo

hippopotami (Grünberg).

8 (7) Tubercles of parafrontalia confluent, only a few isolated.

Otherwise like the foregoing species. Larvae in the nasal cavities of Burchell's Zebra (*Equus burchelli* Gray). — Transvaal.

steyni n.sp.

The diagnosis of the one male of *R. steyni* before me, which is regarded as the holotype, is as follows:

Male — Head in frontal view broader than high. Eyes bare, with small facets. Frons at vertex measuring nearly 3/8 of eyelength, strongly widened towards the antennal groove; frontal stripe reddish and dark brown, slightly narrowed in the middle and here about as wide as the anterior ocellar-tubercle. Vertex with three large, glossy black ocellar-tubercles of more or less semicircular shape. Parafrontalia yellow-brown, with black tubercles which are low, ill-defined and strongly rugose; only a few small tubercles are more or less isolated. A few black hairs arise from the tubercles. Profrons about one third as wide as the eye is long, parafacialia yellow-brown and white pruinose; a few blackish spots, representing very flat tubercles, are present, some of them isolated, others confluent. Lunula yellow. Basal segments of antennae red-brown, the third predominantly black; arista yellow, totally bare. Antennal depression incompletely divided by a triangular elevation. Face and buccae yellow, facial ridge and post-bucca with widely placed black setae. Mouthparts rudimentary; palpi black-brown; proboscis forming a backwardly directed, coniform structure, which is black in the terminal half and yellow in the basal half; a bunch of long black hairs is inserted posterior to the proboscis.

Thorax yellow-brown, with a blackish pattern and a whitish pruinosity. The pattern consists of four longitudinal, well-defined vittae; the median ones are narrow and end a little beyond the suture; the outer ones are broad and extend from the level of the shoulders towards the scutellum. The pleura are partly darkened. Dorsum provided with setiferous black tubercles, which are small (grain-like) on the mesonotum, but bigger and pustule-like on the scutellum. These tubercles are mostly well isolated from one another, rarely a few are close together or more or less confluent. Hairs covering pleura longer and denser than those on the dorsum, and arise from a flat or slightly thickened and elevated base. Mesonotum without bristles; on the pleura, only the posterior margin of the mesopleuron and the hypopleuron bear rows of dense hairs, which are more or less bristle-like. Stigmata yellowish. Wings hyaline, epaulet, basicosta and the bases of costa and stem-vein black; furthermore, a glossy black spot is present on r_1 at base of sc, and 3 more are found in basal part of the wing near the alula; the veins are otherwise yellow or light-brown. Costa provided dorsally and ventrally with a row of spinules, the upper row reaching the fusion of sc and r_{4+5}, the ventral one being abbreviated terminally. Vein r—m situated beyond middle of M_2, which is closed and long-petiolate. Thoracic squama white, without long hairs. Legs with dark and reddish-brown femora and tibiae, knees and tarsi predominantly yellow; hairs black, apparently without taxonomic significance.

Abdomen yellow-brown like the thorax, with glossy black small tubercles and a white pollinosity, which covers the last segments and forms broad lateral and smaller dorsal spots, the sizes of which change with the incidence of light. The tubercles are well separated from one another, flat and of triangular shape and provided with backwardly directed black hairs. Sternites black, densely haired. The hypopygium was not dissected.

Length: 12 mm.

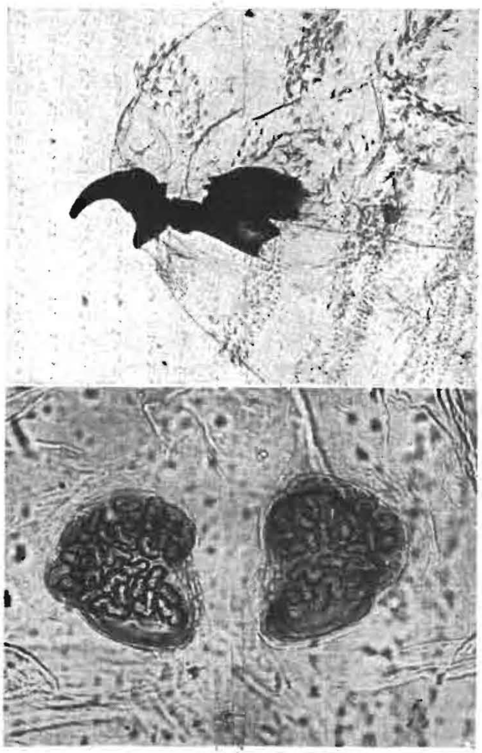
The larva of this fly was recovered from the nasal cavities of one specimen of *Equus burchelli* Gray on 22 April, 1957, it pupated a few hours later, and the adult hatched on 24 May, 1957.

This species is named in honour of Mr. T. J. Steyn, Director of Nature Conservation, Transvaal.

2. **Gasterophilus zebrae** Rodhain & Bequaert.

a) *Larval stages.*

The larvae (3rd stage) recovered from the stomach of the zebra all fit the description given by Rodhain & Bequaert (1920 p. 181) for *Gasterophilus pecorum* var. *zebrae,* from a specimen of *Equus burchelli,* killed at Namirembe on the southern shore of Lake Victoria. They are strikingly similar to that of *G. pecorum* (Fabr.) and hardly distinguishable by the arrangement of the spinulation (fig. 3). Rodhain & Bequaert gave a long description of the



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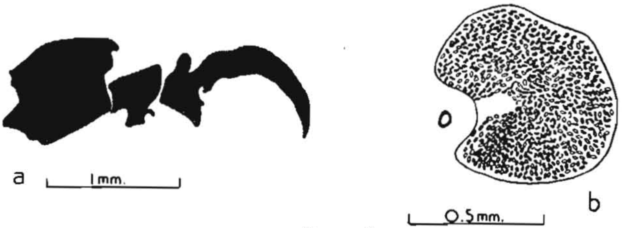

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Fig. 1. *Rhinoestrus steyni* n.sp.
Photomicrograph of the anterior part and the posterior stigmal plates of the 2nd larval stage.

Fig. 2. *Rhinoestrus steyni* n.sp.
Cephalosceleton (a) and one posterior stigmal plate (b) of the 3rd larval stage.

3rd larval stage, but they say finally "que cette larve du zèbre est extremement voisine de celle de *Gasterophilus pecorum* (Fabricius), dont elle ne diffère que par la spinulation un peu plus réduite du onzième segment à la face ventrale". This proves to be true too for the larvae before me, and I have the impression that even this feature varies slightly and sometimes overlaps with the arrangement in *G. percorum.* I have found, however, that the slits of the posterior spiracles are less bent in *G. pecorum* than in *G. zebrae* (comp. figs. 4 & 5).

b) *Imago.*

Rodhain & Bequaert studied one male and one female, both in a very bad state of preservation and partly mutilated which are said to have been reared from the type of larva described by them as *G. percorum* var. *zebrae.* They found that the wing lacked the posterior cross-vein (m—m), that it had an infuscation similar to that found in *G. pecorum,* and that also the remaining features left hardly any doubt "quant à leur étroite affinité avec *G. pecorum*". They did not mention any outstanding features with regard to the structure of the hind leg.

I have succeeded in rearing 1 ♂ and 3 ♀ ♀ which are not related at all to *G. pecorum,* but to *G. intestinalis* from which, however, they are easily separable by well-defined, dark spots on the wings and by shorter hind legs and more (♂) or less (♀) broadened hind tibiae and tarsi. Other separating features are given in the description below.

Notwithstanding the bad condition of their specimens, it is improbable that Rodhain & Bequaert overlooked the features given above, or the spatulate process of the hind trochanter which is highly characteristic for *G. intestinalis* and for the species I have reared. Furthermore, the posterior cross-vein is distinctly developed in my specimens, whereas it is said to be wanting in the specimens examined by Rodhain & Bequaert.

I therefore believe that the adult specimens which Rodhain & Bequaert assigned to *G. pecorum* var. *zebrae,* actually did not belong to the type of larva described by them under this name, but perhaps to *G. gedoelsti* Rodh. & Bequ. which was found in the same specimen of zebra.

EXPLANATIONS OF FIGURES

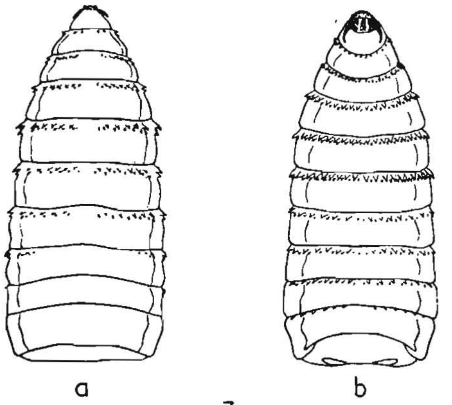
Fig. 3. *Gasterophilus zebrae* Rodhain & Bequaert.
Dorsal (a) and ventral (b) view of the 3rd larval stage (after Rodhain & Bequaert).

Fig. 4. *Gasterophilus pecorum* (Fabricius).
Posterior stigmal plates of the 3rd larval stage.

Fig. 5. *Gasterophilus zebrae* Rodhain & Bequaert.
Posterior stigmal plates of the 3rd larval stage.

Fig. 6. *Gasterophilus zebrae* Rodhain & Bequaert.
Photomicrograph of a wing.

Fig. 7. *Gasterophilus zebrae* Rodhain & Bequaert.
Cerci with paralobi in frontal view.



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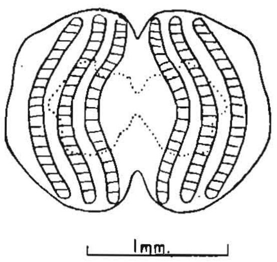

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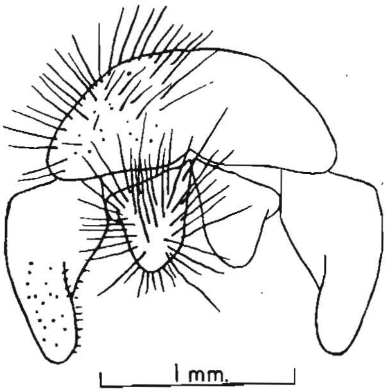

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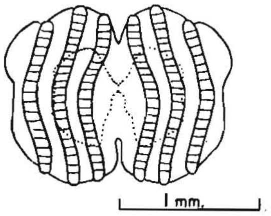

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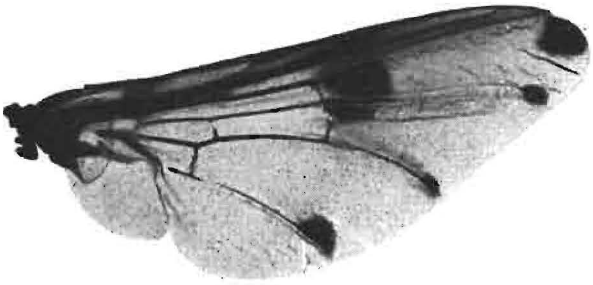

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The specimens reared by Rodhain & Bequaert were not present in Rodhain's collection when it was examined for all Gasterophilidae and Oestridae after his death by Dr. P. L. G. Benoit, Musée Royal du Congo Belge. According to him (by letter), they may be regarded as lost.

Male — Head in frontal view broader than high, eyes bare, with small facets. Frons at vertex measuring 5/8 of eye-length, strongly widened towards the antennal groove; frontal stripe dark yellow, but ocellar triangle black. Parafrontalia coloured like the frontal stripe, both densely beset with long and fine, mostly dark-brown hairs (yellow in *intestinalis*); pollinosity dull yellow. Profrons about one third as wide as the eye is long. Parafacialia with two large, but ill-defined and partly pollinose, blackish spots in the upper and the median part, remaining area yellow; hairs in the upper half black-brown, in the lower part yellow. Buccae and face light yellow, densely beset with pale hairs. Antennae dark yellow.

Thorax black-brown, but densely covered with long dark yellow and reddish hairs. Wing-venation as in *intestinalis,* but the pattern is well-defined and sharply contrasting (see fig. 6.). Legs yellow-brown, but the terminal part of the hind tibia and the greatest part of the 1st tarsal segment blackened. In *G. intestinalis,* the legs are wholly yellow and generally more slender. The hind leg of the male of *G. zebrae* is especially stout, the tibia being distinctly flattened and dilated terminally. The first tarsal segment is as broad as the hind part of the tibia, measuring a little less than a third of the tibial length. In *G. intestinalis* the hind tibia is of normal width and the first tarsal segment measures about half the length of the tibia. Spatulate process of the hind trochanter broad and long, similar in shape to that of *intestinalis.* Abdomen yellow, the hind halves of the tergites slightly darker yellow; the hind margins each with six narrow, transversely placed little black spots. Hairs of the dorsal side relatively short, lying close to the surface, black in the posterior half of the tergite, yellow in the anterior part; on the ventral side the hairs are long and dense, yellow and blackish in colour. In *G. intestinalis,* all hairs are yellow, dorsally longer and more erect than *in zebrae.* Hypopygium black, similar in structure to that of *intestinalis* (fig. 7.).

Female — Frons at vertex only a little narrower than the eye is long (65:75). Legs more slender than in the male, but the hind tibia and the 1st tarsal segments are nevertheless distinctly dilated, the latter measuring 5/9 of the tibial length. The 3 specimens before me show that the black marginal spots of the abdominal tergites are slightly variable in size and in number.

Length: 10 mm. (The specimens of *G. intestinalis* before me measure from 12 to 15 mm. in length, excluding the post-abdomen).

The larvae of these flies (1 ♂, 3 ♀ ♀) were recovered from the stomach of one specimen of *Equus burchelli* Gray on 22 April, 1957. The period of pupation lasted 4—5 weeks.

SUMMARY.

A specimen of Burchell's Zebra (*Equus burchelli* Gray) killed near Lesitele, N. Transvaal, was found to harbour larval stages of a species of *Rhinoestrus* in its nasal cavities, and those of a *Gasterophilus* species in its stomach. The author succeeded in rearing one male fly of the *Rhinoestrus* species which proved to be new to science and which is described as *R. steyni n. sp.* From the isolated larvae of *Gasterophilus*, one male and three female flies hatched, which also proved to be undescribed up to now. On the basis of the description of the 3rd larval stage, these flies are assigned to *G. zebrae* Rodhain & Bequaert.

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